REMARKS

Applicants have requested that the specification be amended to add the Government grant information as indicated above. If the Examiner has any questions, he is invited to call the Applicants' Attorney at the number provided below.

Respectfully submitted,

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TRA 1550372v1

This application claims the benefit of U.S. Provisional Application No. 60/006,413, filed November 9, 1995, and titled "Aperiodic Ultrasound Phased Array".

STATEMENT AS TO FEDERALLY SPONSORED RESEARCH

This invention was made with U.S. Government support under National Institutes of Health grant No. R01CA48939. The government has certain rights in the invention.

Technical Field

The present invention relates to medical devices generally and, more particularly, to devices for ultrasound deposition in body tissue for use in medical treatment.

Background of the Invention

The deposition of ultrasonic energy within the human body has numerous useful and promising medical applications. For example, ultrasound may be used for tissue ablation, diagnostic imaging, drug delivery, and other therapies which employ heat, cavitation, shock waves (e.g. destroying kidney stones) or other thermal and/or mechanical effects for therapeutic purposes.

A particularly advantageous use for ultrasonic energy deposition is thermal therapy (also known as hyperthermia, tissue ablation, and/or thermal surgery) which treats internal cancers and other internal diseases that respond to increases in body tissue temperature. Thermal therapy entails generating an ultrasonic energy beam and electrically focusing and controlling the energy beam to provide localized energy deposition in body tissue thereby heating the body tissue. Clearly, it is critical that the ultrasonic energy be focused to treat a desired target area of body tissue, and to avoid applying ultrasonic energy outside of the target area.

Prior art ultrasonic energy applicators typically have focusing and power difficulties. On the one hand, it is desirable to use high-frequency ultrasound to focus the beam more sharply and to improve power absorption in the target tissue thereby reducing near field and post-focus heating. On the other hand, higher frequencies generally result in large "grating lobes" (i.e. secondary focal points around the target area) that result in undesired heating, cavitation or other thermal/mechanical effects in non-targeted tissues.

The conventional technique for reducing grating lobes is to use small radiating elements having a center-to-center spacing of half a wavelength (or less) apart. However,